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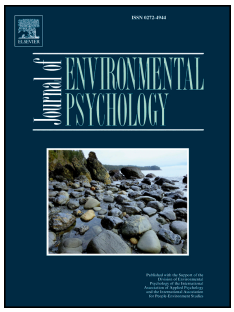

Perception of public opinion on global warming and the role of opinion deviance

Adina T. Abeles, Lauren C. Howe, Jon A. Krosnick, Bo MacInnis

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Author names and affiliations:
Adina T. Abeles (corresponding author)[a] , Lauren C. Howe[b], Jon A. Krosnick[c], Bo MacInnis[d]

[a] Department of Communication
Building 120, Room 110
450 Serra Mall
Stanford University
Stanford, CA 94305
e-mail: abeles@stanford.edu
phone: 831-402-5132
fax: 650-725-2472

[b] Department of Business Administration
University of Zurich
e-mail: lauren.howe@business.uzh.ch

[c] Departments of Communication, Political Science, and Psychology
Stanford University
e-mail: krosnick@stanford.edu

[d] Department of Communication
Stanford University
e-mail: bmacinni@stanford.edu

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Abstract

People tend to perceive their own opinions to be especially prevalent among others, especially among members of their in-groups. This paper proposes that this process operates differently in groups with prominent figures who take public stances on issues (*opinion cues*) that suggest what group members do or should think when some members of such groups are *opinion deviant*, meaning that their own opinions differ from their group's opinion cues. Two studies of Democrats', Republicans' and Independents' perceptions of others' views on global warming in two national surveys of probability samples of American adults (N = 804 in 2012, and N = 1000 in 2018) showed that whereas partisans whose own beliefs aligned with the opinion cues of their political party perceived their own beliefs to be more prevalent among members of their own party and perceived the opposite belief to be more prevalent among members of the other party, opinion deviants (e.g., Republicans who believe that global warming has been happening) did not. Furthermore, aligned partisans perceived a larger partisan gap than opinion deviants. This research illuminates a new way in which group membership affects perceptions of public opinion on environmental issues and suggests novel strategies for climate change communication.

Key words: Public perception, public opinion, global warming, climate change, false consensus, polarization

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1. Introduction

Much research on global warming public opinion has focused on the distributions of people's beliefs about the existence and threat of global warming, the predictors and behavioral consequences of these beliefs, and how to engage people on the issue (e.g., Hornsey, Harris, Bain, & Fielding, 2016; Moser, 2016). Other research has explored people's policy preferences on the issue and illuminated how personal experiences and information presentation shape these preferences (e.g., McAdam, 2017, p.192-193). To date, this work has largely ignored the importance of perceptions of others' beliefs about global warming as drivers of individual attitudes, preferences, and behaviors.

Social psychologists have long recognized the influential role that others' beliefs and behaviors (i.e., social norms) play in shaping an individual's judgements and behaviors (e.g., Asch, 1951; Cialdini & Goldstein, 2004; Jacobs & Campbell, 1961; Sherif, 1936). And more recently, researchers have documented how these norms potentiate environmental behaviors (Cialdini & Goldstein, 2004; Goldstein, Cialdini, & Griskevicius, 2008; Miller & Prentice, 2016; Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007; Sparkman & Walton, 2017). But only a small number of recent studies have begun to recognize the importance of perceptions of others' beliefs about global warming. These studies have illuminated instances in which perceptions of public opinion on global warming are inaccurate. A study of a probability sample of Australian adults found that a majority of Australians misperceived public opinion on global warming, underestimating the number of people who think global warming is human-caused (Leviston, Walker, & Morwinski, 2012). Two other studies of non-probability samples of American adults indicated that people underestimate the percent of people who believe that

global warming (Mildenberger & Tingley, 2017) or climate change (Ehret, Boven, & Sherman, 2018) is happening.

When misperceptions such as these occur, people may act or behave in ways that are counter to their privately held beliefs (Krueger, 1998), such as publicly supporting policies with which they do not agree (Todorov & Mandisodza, 2004). Supporting this idea, Geiger and Swim (2016) found that misperceptions of others' global warming beliefs has consequences. Undergraduates who incorrectly assumed that most other students do not think global warming is happening were less willing to discuss global warming with their peers.

If people tend to underestimate the extent to which others believe that global warming is happening, that may explain a lack of support for climate change policies, and/or a depressed willingness to talk about the issue with others (Doherty & Webler, 2016; Leiserowitz, Maibach, Roser-Renouf, Feinberg, & Rosenthal, 2015). For example, Mildenberger and Tingley (2017) found that respondents who perceived fewer Chinese citizens to think global warming was occurring were less likely to support a U.S. bilateral climate agreement with China. Thus, intervening to correct misperceptions may be a fruitful way to galvanize support for action on climate change (Miller & Prentice, 2016; Prentice & Miller, 1996). To correct misperceptions, however, it is important to understand the underlying factors that influence perceptions of others' opinions in the first place (Walton, 2014). Yet research on perceptions of climate change public opinion has yet to explore why misperceptions exist.

Previous research on attitude perception generally suggests that people could rely on a variety of data points to estimate others' beliefs. One well-studied data point is a person's own beliefs and actions (Dawes, 1989, 1990); people are thought to assimilate others' opinions toward their own (Ross, Greene, & House, 1977). Group membership is thought to moderate this

process; the more similar a person is to a group, the more that person assimilates group members' opinions toward their own (Robbins & Krueger, 2005). West and Kenny (2011) described this assumed similarity between the perceiver and target as a form of bias influencing individuals' judgement of others' beliefs. More recent research indicates that dissimilarity is also an influential force shaping perceptions of others' beliefs, showing that individuals contrast disliked outgroup members' opinions away from their own (Gromet & Van Boven, 2014).

In this paper, two shortcomings of these previous literatures are addressed. First, Americans' perceptions of others' beliefs about global warming are measured in two national probability samples of American adults. Probability samples provide more accurate measurements of public opinion in populations than do non-probability samples (e.g., MacInnis, Krosnick, Ho, & Cho, 2018; Yeager et al., 2011) and therefore offer sound ground on which to reach conclusions about accuracy of perceptions of public opinion in the public.

Second, this paper explores additional factors that influence perceptions of public opinion on global warming. Specifically, we introduce a new perspective on how group membership might influence individual's judgements of group members. Some groups, such as political parties, have prominent figures who publicly espouse viewpoints. These figures can shape individuals' perceptions of what group members think. When an individual's belief conflicts with the beliefs espoused by the group's prominent figures, these individuals are *opinion deviant*. This paper explores perceptions of others' beliefs held by opinion deviants, testing whether such people rely on their own belief, the cues from prominent figures, or both, when forming perceptions of others' beliefs about global warming in the United States. The paper makes novel contributions by discussing perceptions of public opinion on global warming, how opinion

deviance impacts these perceptions, how these findings advance our understanding of perceptions of group members, and their implications for climate change communication.

2. A new theory of group membership and perceptions of public opinion

2.1. Background: Group membership and perception

A great deal of research has found a strong positive correlation between a person's own belief and perceptions of others' beliefs on the same issue (e.g., Marks & Miller, 1987; Ross, Greene, & House, 1977). However, this early research did not take the role of group membership into account. More recent research began to investigate how ingroup and outgroup membership moderates this relationship. Researchers repeatedly demonstrated that a person's beliefs correlate more strongly with their perceptions of in-group members' beliefs than with perceptions of the beliefs of members of other groups, a relationship often referred to as in-group projection or assumed similarity in the literature (Ames, 2004; Billig & Tajfel, 1973; Clement & Krueger, 2002; Robbins & Krueger, 2005; Tajfel, Billig, Bundy, & Flament, 1971; West & Kenny, 2011). In contrast, evidence is mixed regarding whether people perceive the *opposite* belief to be more prevalent among out-group members than in-group members (i.e., assumed out-group dissimilarity). One meta-analysis did not find evidence of assumed out-group dissimilarity (Robbins & Krueger, 2005).

However, past research has largely focused on social groups that were not formed around socially or politically contentious issues (e.g., academic affiliation, nationality, ethnicity), and Robbins and Krueger (2005) suggested that particular circumstances may be necessary to elicit these effects. Political partisans (i.e., Americans who identify as Democrats or Republicans) may have the characteristics necessary to solicit strong in-group assumed similarity and out-group

assumed dissimilarity. In-group and out-group animus among political partisans in the United States has increased since the 1960's (Alford, Hatemi, Hibbing, Martin, & Eaves, 2011; Iyengar & Krupenkin, 2018; Iyengar, Sood, & Lelkes, 2012), and bias based on political party has outpaced biases based on race, religion, and gender (Iyengar & Westwood, 2015). The desire to differentiate oneself from the out-group might lead people to believe that out-groups endorse the *opposing* view compared to in-groups. Offering initial evidence for this view, Gromet and Van Boven (2014) observed assumed out-group dissimilarity (what they called oppositional projection) in the context of Democrats and Republicans' perceptions of beliefs about cap trade policies to address global warming.

2.2. Groups with opinion cues

Exploration of these issues is enriched by the recognition that some groups have spokespeople who send signals to others about how group members should or do think. When groups have prominent public figures, these figures' statements provide additional data points that may influence perceptions of group members' beliefs. Prominent figures can be officially or unofficially associated with a group and may publicly pronounce a purported majority group opinion. For example, officials speaking for political parties include politicians and representatives from national, state, and local political party committees, and these people often make public statements endorsing a certain stance on an issue. Unofficial figures include people who serve as exemplars, such as people whom activists or media pundits identify and highlight as demonstrating how excellent or typical group members behave. Thus, for some groups, another data point that might influence perception of group members' beliefs are *opinion cues*: the publicly espoused opinions of prominent figures on behalf of a group.

Opinion cues are related to, but different from, elite or party cues as discussed in the political science literature. Elite cues have been described as a shortcut to help individuals form their own opinions on complex topics (Popkin, 1994; Sniderman, Brody, & Tetlock, 1991; Zaller, 1992). Public statements by elected officials, activist organizations, interest groups, and political parties can be used by citizens as an information shortcut to decide how they should think about a specific issue, particularly when taking the time to understand the issue is not worth the effort or not possible (Kuklinski & Quirk, 2000). In addition, political commentators on television and talk radio can similarly signal listeners what conservative or liberal individuals should or do think about an issue (Feldman, Maibach, & Leiserowitz, 2012). While party cues provide a heuristic for individuals when forming an individual opinion, opinion cues, we posit here, might provide a heuristic for individuals when considering what group members think.

Some groups, such as "college students," "parents," or "unions" are well-defined and can be important to a person's social identity, but these types of groups do not always send clear signals about what group members should or do think. For example, some groups may not have associated prominent figures, leaders, or institutions that make public statements about issues (e.g., there is no one spokesperson for all parents). Or groups may have prominent figures, but because these groups are formed for reasons other than shared opinions, people may not assume that these leaders represent group members' opinions or beliefs.

However, if groups are formed based on shared values or beliefs, such as activist groups or political parties, people may be more likely to believe that prominent figures' opinions reflect the opinions shared by a majority of group members. People may have different lay theories about why there is a relationship between prominent figures and group members' opinions. First, prominent figures might represent the group's *prior* opinions and have been elevated to a

position of power on that basis. Or, people may think that leaders persuade group members to adopt an opinion and thus come to represent the general opinions of the group. Regardless of the theory as to why the relationship exists, opinion cues from these groups likely act as a heuristic upon which people base perceptions of group members' opinions. This assumption makes sense, since people are, in reality, particularly responsive to party endorsements when forming their own opinions (Cohen, 2003; Slothuus & De Vreese, 2010).

Critically, however, for groups in which opinion cues are present, individuals may sometimes exhibit *opinion deviance*, when they hold an opinion in direct conflict with opinion cues of their group. For instance, some Democrats who are pro-life, some members of the Green Party support the use of nuclear energy, and some Republicans are concerned about climate change. Although opinion deviance characterizes many groups in the public discourse, its influence on perceptions of in-groups and out-groups is not yet known.

2.3. Opinion deviance as a moderator

Opinion deviance raises a puzzle for the study of perceptions. When a person is not an opinion deviant, there is no reason to doubt that people will assume more similarity between their own opinion and in-group members' opinions (reinforced by the opinion cues) and to assume more dissimilarity from the opinions of outgroup members (reinforced by the opinion cues of the outgroup). Previous research suggests that opinion deviants' beliefs may be positively correlated with perceptions of in-group opinions, despite any conflicting opinion cues

However, our theory proposes that opinion cues may alter perceptions of in-groups and out-groups. Perceivers may use the data points of opinion cues and their own beliefs additively or interactively. In an additive model, a perceiver weighs the data points of the self and the prominent figures and sums the two weighted data points to result in a perception of group

members. Under this model, opinion deviants' assumed similarity with in-group members might be suppressed by the opinion cues of their in-group which signal that in-group members think differently than the self. Under an interactive model, perceivers may believe that prominent figures' opinions are so informative that they no longer use their own opinions as data points, presuming that they are not representative of the group. In this scenario, opinion deviants may not consider their own opinion at all when assessing others' opinions. In other words, opinion cues may prevent opinion deviants from assuming similarity in the first place.

2.4. Opinion cues and global warming

The current study treats opinion cues as a constant across respondents, and we presume that opinion cues are constituted by statements made by people who are prominently associated with particular political parties. These might be members of a party elected to high office or people who are employed by the party of prominent spokespeople known to endorse the party. In the United States, global warming has been discussed quite differently by prominent Democrats and Republicans: prominent Republicans have often questioned natural scientists' claims about climate change, whereas some prominent Democratic figures have often endorsed natural scientists' belief about climate change. According to a recent analysis of more than 8,000 news stories printed between 1980 and 2014, Democratic elected officials have made statements indicating belief in the existence of global warming and/or support for policies to address global warming much more consistently than have Republican elected officials (Merkley & Stecula, 2018). In contrast to Republican Senator James Inhofe's book "The Greatest Hoax" are the movies made by and speeches given by Democrat Al Gore.

The 2012 and 2016 Democratic Party Platform affirmed the findings of natural science research on climate change and committed to reduce greenhouse gas emissions. In contrast, the

2012 Republican Party Platform mentioned climate change to criticize the Obama Administration's national security strategy, which allegedly failed because it prioritized the environment over national security. The 2016 Republican Party Platform called into question the objectivity of climate science, and President Donald Trump has similarly called into question the validity of climate science on numerous occasions. Furthermore, Fox News (a Republican-leaning outlet) has often challenged climate science, whereas MSNBC (a Democratic-leaning outlet) has tended to emphasize the conclusion that anthropogenic climate change is real (Feldman et al., 2012).

Thus, a variety of prominent Republican and Democratic figures have expressed opinions about global warming, and members of the general public may use those opinion cues from elites when forming their own perceptions of what Democratic and Republican members of the public think. This may lead to the conclusion that more members follow opinion cues than actually do and thus lead to the perception that Democrats and Republicans are farther apart than they are in actuality. Because partisans likely assimilate in-group members' opinions towards their own and contrast outgroups members' opinions away, partisans who are not opinion deviant might be especially likely to perceive an exaggerated difference between the issue positions held by Democrats and Republicans. Indeed past research has documented exaggerated perceptions of partisan gaps on a variety of other issues: Americans view their fellow citizens as more divided along partisan lines than they actually are, and that this gap is exaggerated for partisans (e.g., Levendusky & Malhotra, 2015; Westfall, Van Boven, Chambers, & Judd, 2015).

3. The present studies

Researchers measure global warming beliefs in a variety of different ways, and thus

perceptions of others' belief in global warming can be operationalized in different ways. The current studies focus on the fundamental belief that global warming has been happening (i.e., that the global average temperature has been increasing for any reason). Perceptions of this belief may be particularly influential, because if people do not believe that others think that global warming is happening at all, there is no reason to expect that a dialogue on addressing global warming will take place.

3.1. Hypotheses

The present studies explore the distribution of Americans' perceptions of other's belief in the existence of global warming, and how opinion deviance impacts those perceptions.

The current study first tests the following hypotheses:

False consensus: As described in Marks and Miller (1987), "individuals are said to perceive a false consensus when their estimate of consensus for their own position exceeds the estimate for it made by those who endorsed the opposite position" (p. 74). In this context, the data would support the false consensus hypothesis if people who think global warming has been happening estimate that a relatively larger percentage of the public thinks that global warming has been happening than the people who do not think that global warming has been happening.

Opinion cues: Compared to their perceptions of the general public, people may perceive more Democrats to think global warming has been happening and fewer Republicans to think global warming has been happening.

In-group assumed similarity: Past research investigating perceptions of in-group and out-group members typically compared perceptions of the in-group to those of the out-group. To test predictions about perceived in-group similarity and out-group dissimilarity in this study, partisans' estimates of how many Democrats and Republicans think global warming has been

happening was compared to their estimates of how many Americans' think global warming is happening. Compared to their perceptions of the general public, partisan respondents may estimate a larger percentage of co-partisans to hold the same belief as they do.

Outgroup assumed dissimilarity: Compared to their perceptions of the general public, partisan respondents may estimate a lower percentage of members of the opposite party to hold the same belief as they do.

Partisan gap: Respondents may perceive there to be a larger difference in the beliefs held by Democrats and Republicans than actually exists.

Then, this study builds on this past research by testing the novel prediction of *moderation by opinion deviance:*

- Opinion aligned Democrats may show evidence of in-group assumed similarity and out-group assumed dissimilarity. That is, Democratic respondents who think global warming has been happening may estimate that more Democrats think it has been happening and estimate that more Republicans do *not* think global warming has been happening, when compared to estimates of Americans in general.
- Opinion aligned Republicans may show evidence of in-group assumed similarity and out-group assumed dissimilarity. That is, Republican respondents who do not think global warming has been happening may estimate that more Republicans *do not* think it has been happening and estimate that more Democrats *do* think it has been happening, when compared to estimates of Americans in general.
- However, opinion deviant respondents (Republicans who think global warming is happening and Democrats who do not) may not show evidence of either in-group assumed similarity or out-group assumed dissimilarity.

3.2. Study design

To test the hypotheses, data were collected via a random digit dial telephone survey of a nationally representative sample of 804 American adults (18 years of age or older) from June 13 – June 21, 2012 (Study 1, see Supplemental material for details on survey methods) and analyzed. The robustness of the findings was tested by analyzing data from a second random digit dial telephone survey of a nationally representative sample of 1000 American adults (18 years of age or older) from May 7 – June 11, 2018 (Study 2, see Supplemental material for details on survey methods). Both data collection efforts were reviewed and approved by an Institutional Review Board.

In both surveys, interviewers told respondents that the survey was for research purposes and that answers will be kept confidential and analyzed in statistical form only. After indicating that they will move forward with the survey and other introductory questions, respondents indicated whether they thought global warming has been happening, and then answered questions about their opinions on related issues. Several minutes later in the survey, respondents estimated the percentage of Americans who think that global warming has been happening, the percentage of Democrats who think that global warming has been happening, and the percentage of Republicans who think that global warming has been happening. Finally, respondents reported their political party identification. Respondents were always asked about Americans first to reduce the possibility of a question order effect. If asked about Democrats and Republicans first, respondents might have answered the question as a summary of partisan perceptions, rather than as a general perception of the American public (Schwarz, Strack, & Mai, 1991), or may have excluded partisan considerations from their estimate of what the general public thinks (Mason,

Carlson, & Tourangeau, 1994). For question wording in both surveys, see the online Supplement (Section S.3).

3.3. Measures

Global warming existence belief: Responses were coded 1 if respondents answered that the world's temperature probably has been going up over the last 100 years, 0 otherwise.

Estimate: Respondents estimated the percentages of Americans, Democrats, and Republicans who would answer that the world' temperature has been going up over the last 100 years. Respondents always estimated the percentage of Americans first, and then were randomly assigned to estimate the percentage of Republicans or Democrats next. Estimates were an integer between 0 and 100.

Target: Dummy variables were created to indicate whether a respondent's estimate referred to Republicans, Democrats, or Americans (omitted).

Perception of difference: This was calculated as the difference between a respondent's percentage estimate of Democrats and a respondent's percentage estimate of Republicans.

Party identification. Dummy variables were created to identify Republican respondents, Democratic respondents, and others (omitted).

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4. Analyses

As has been true for much of the previous work on perception formation, these analyses are based on cross-sectional data, so it is not possible to test causal hypotheses directly (see West & Kenny, 2011). The analyses reported below can yield results that are consistent or inconsistent with the proposed causal perception formation story.

Analyses conducted with the 2012 data were repeated using 2018 data to test for robustness of the findings over time. The analyses included both descriptive statistics to understand the distribution of Americans' perceptions of what others think about global warming, as well as regression analysis to test the hypotheses. In all the analyses of the 2012 data described below, weights were applied to correct for differential probabilities of selection. Each member of the public has a different probability of being sampled depending upon how many people are associated with a phone number and how many phone numbers are associated with a person. Weights were applied to adjust for these different probabilities. Weights were also applied to align the sample with benchmarks from the 2010 American Community Survey for population proportions in terms of age and gender cross-tabulated, education and gender cross-tabulated, ethnicity and race, and Census region (see Table S2 in online supplement). Weights were applied in the 2018 data analyses to correct for differential probabilities of selection as well as to align the sample with benchmarks from the 2018 March Supplement of the Current Population Survey for age, sex, education, race/ethnicity, and census region (see Table S3 in online supplement).

4.1. Descriptive statistics

The percentage of Americans, Democrats and Republicans who thought global warming had been happening were calculated for Study 1 and Study 2 using the weighted data. These

estimates served as a benchmark for their respective studies to which the respondents' perceptions of how many Americans, Republicans and Democrats think global warming has been happening were compared.

4.2. Hypothesis testing

There was sufficient power to detect a medium difference (d = 0.5) in perceptions between opinion deviant and opinion aligned respondents in each political party. In 2012, the sample of opinion deviant and opinion aligned Republicans (N = 105, N = 69) and the sample of opinion deviant and opinion aligned Democrats (N = 31, N = 225) provided an overall power for detecting a medium effect size of 89% and 74% respectively. In 2018, the power for detecting a medium-sized difference in perceptions falls to 68% for Democrats and rises to 98% for Republicans.

Parameters of a series of mixed effects ordinary least squares (OLS) regression models were estimated. In each model, the three estimates that each respondent made of the prevalence of global warming existing belief (one estimate each for Americans, Republicans, and Democrats as targets) were stacked as the dependent variable. Dummy variables were created to indicate the three different estimated populations (referred to as 'target') as predictor variables. Because each respondent provided three estimates, the random effect of the individual respondent was taken into account. The parameters of the mixed effects OLS models were estimated using the lme4 package in R (Bates, Mächler, Bolker, & Walker, 2015; R Core Team, 2016) and controlled for age, gender, income, level of education, race, ethnicity and region. The main predictor variables of interest included global warming existence belief, political party identity and target.

An initial regression with an additive model (see Table 1, Column 3) tested for false consensus and the influence of opinion cues. Variance inflation factors for the additive models in

both 2012 and 2018 were below 2.5, so multicollinearity was not a concern. To test for moderation by opinion deviance, a second, multiplicative model (see Table 1, Column 4) included a three-way interaction between one's own belief, one's own political party identity and the target. Because this hypothesis focuses only on partisans, only respondents who identify as Democrats or Republicans were included in the multiplicative regression model.

To interpret the three-way interactions from the multiplicative model, parameters of four additional mixed-effects OLS regressions were estimated to test the simple main effects of the target for the following four populations:

- Opinion aligned respondents: Republicans who do not think global warming is happening, and Democrats who do; and
- Opinion deviants: Republicans who think global warming is happening, and Democrats who do not.

For the first two regression models, belief in global warming was dummy coded 1 for those respondents who thought global warming had been happening and 0 otherwise. The first regression model was estimated with Republican respondents only, and the second was estimated with Democratic respondents only. The coefficient for target is therefore an estimate for the simple main effect of the target on Republicans and Democrats who *did not* think global warming had been happening (i.e., opinion aligned Republican respondents and opinion deviant Democratic respondents). Two additional regressions were set up identically to the ones described previously, except that global warming existence belief was dummy coded in the opposite manner (1 for disbelief, 0 for belief). In this way, it was possible to look at the simple effects of target on Republican and Democratic respondents who *did* think the Earth had been warming (i.e., opinion aligned Democrats and opinion deviant Republicans).

To compare perceived differences in global warming beliefs between parties with the actual difference in belief, the actual difference between parties and the perceived difference must be calculated. A weighted regression predicting belief in global warming from party identification was used to calculate the 95% confidence interval of the actual difference between Democratic and Republican respondents. The perceived difference was calculated by finding the mean and confidence interval of the respondents' perception of the difference.

5. Results

5.1. Study 1: 2012 survey

5.1.1. Perceptions of Americans, Democrats, Republicans

On average, Americans underestimated the percent of Americans, Democrats, and Republicans who thought global warming had been happening (Figure 1). Specifically, 73% of Americans believed that global warming had been happening. But respondents estimated that an average of 55% of Americans thought that. Further, 86% of Democrats and 57% of Republicans believed that the Earth had been getting warmer, but on average, respondents thought that only 63% of Democrats and 45% of Republicans believed that. This is the first national probability sample demonstrating this underestimation. These estimates did not significantly differ if the perceiver identified as a Republican, a Democrat, or something else (Figure 1).

Respondents, on average, did not perceive both political party members accurately. Sixty-seven percent of Americans accurately estimated that the majority of Democrats believed that global warming had been happening. However, 66.5% of Americans inaccurately estimated that the majority of Republicans did *not* believe that global warming had been happening (see the distributions of responses in Figures S2-S4 in the online supplement).

5.1.2. False consensus, opinion cues, and the partisan gap

The additive model, which tested the false consensus, opinion cues, and partisan differences hypotheses, is first discussed below.

5.1.2.1. False consensus

False consensus was evident. On average, people who believed that global warming had been happening estimated, 6.7 percentage points more people to think that as well, compared to people who did not believe that global warming had been happening ($b = 6.7$, $p < 0.001$; see Table 1, Model 1).

5.1.2.2. Opinion Cues

In line with the hypothesis that Democrats send stronger opinion cues signaling belief in global warming, and Republicans send weaker opinion cues signaling belief in global warming, respondents estimated on average that 10 percentage points fewer Republicans believed that global warming had been happening than Americans in general ($p < 0.001$), and that 7 percentage points more Democrats believed that global warming had been happening than Americans in general ($p < 0.001$) (see Table 1, Model 1).

5.1.2.3. Partisan gap

However, on average, respondents did not exaggerate the difference between Democrats' and Republicans' belief in the existence of global warming (perceived difference: 17.9% [15.5%-20.4%], actual difference: 29.3% [18.6%-40%]). Thus, contrary to expectations, there was no evidence that people perceived an exaggerated partisan gap.

5.1.3. Moderation by opinion deviance

In the sample of self-identified Democratic and Republican respondents (N = 430), 29% of respondents were opinion deviants, including 14% of Democrats and 57% of Republicans[1]. The three-way interaction between existence belief, political party identity and target was significant ($p < 0.001$), indicating that perceptions of in-group and out-group members was dependent upon the relationship between individual belief and the opinion cues of one's own group (see Table 1, Model 2).

5.1.3.1. Opinion deviance and assumed similarity

Assumed in-group similarity and out-group dissimilarity was evident for aligned respondents (see Figure 2, left panel). Simple effects revealed that, on average, opinion aligned Republican respondents estimated that significantly fewer Republicans thought global warming had been happening ($b = -16.83$, $p < 0.001$) and that significantly more Democrats thought so ($b = 16.91$, $p < 0.001$) compared to their estimates of Americans. Opinion aligned Democratic respondents estimated, on average, that significantly more Democrats thought global warming had been happening ($b = 11.16$, $p<0.001$), and that significantly fewer Republicans thought so ($b = -12.83$, $p < 0.001$).

But for opinion deviant respondents, in-group and out-group perceptions did not differ from perceptions of the country as a whole. On average, opinion deviant Democratic respondents did not perceive in-group similarity ($b = 1.07$, $p > 0.7$) or out-group dissimilarity ($b = -3.12$, $p > 0.4$), nor did they show an influence of opinion cues (e.g., did not estimate that more Democrats and fewer Republicans believed in global warming). On average, opinion deviant Republican respondents also did not perceive in-group similarity ($b = -5.99$, $p < 0.05$) or out-group

[1] These are percentages calculated using sample weights.

dissimilarity (b = 1.59, p > 0.1). Interestingly, while they did not perceive co-partisan similarity, they did perceive Republicans to follow party cues. Opinion deviant Republican respondents estimated, on average, that fewer Republicans (when compared to their estimates of Americans) thought global warming had been happening (b = -5.99, p < 0.05). For regression coefficient estimates, see the supplementary material (Table S4).

5.1.3.2. Opinion deviance and the partisan gap

Opinion deviance influenced perceptions of the divide between parties. On average, opinion aligned Republican and Democratic respondents perceived the divide within the actual 95% confidence interval (34% and 24%, respectively). In contrast, on average, opinion deviant respondents underestimated the difference (7.6% for Republicans who did believe that global warming had been happening and 5% for Democrats who did not).

5.2. Study 2: 2018 survey

5.2.1. Perceptions of Americans, Democrats, Republicans

Results were similar to the results in 2012. Americans underestimated the percentage of Americans, Democrats and Republicans who thought global warming had been happening (Figure 1, panel 2). Specifically, Americans perceived only 57% of other Americans to think global warming had been happening while 74% of Americans actually thought that. Further, 87% of Democrats and 57% of Republicans believed that the Earth had been getting warmer (no significant change from 2012), but Americans, on average, thought that only 69% of Democrats and 43% of Republicans believed that. There was no difference in the average estimates respondents provided about the percentage of belief among Republicans or Americans in general, but there was a significant increase in the average perception of how many Democrats thought global warming had been happening (p < 0.001).

[INSERT FIGURE 1 ABOUT HERE]

Once again, Americans in aggregate perceived the country to be almost evenly split on the issue of global warming, when in fact nearly three-quarters of the country agreed it had been happening. Seventy-five percent of Americans accurately estimated that the majority of Democrats believed that global warming had been happening. However, 71 percent of Americans inaccurately estimated that the majority of Republicans did *not* believe that global warming had been happening – an increase in incorrectly perceiving the Republican majority by 4.5 percentage points. The complete distribution of responses can be seen in Figures S5-S7 in the online supplement.

5.2.2. False consensus

False consensus was evident. On average, people who believed that global warming had been happening estimated that 5.5 percentage points more people thought that as well, compared to people who did not believe that global warming had been happening ($b = 5.5$, $p < 0.001$; see Table 1, Model 3).

5.2.3. Opinion Cues

In line with the hypothesis that Democrats send stronger opinion cues signaling belief in global warming, and Republicans send weaker opinion cues signaling belief in global warming, respondents estimated on average that 13.5 percentage points fewer Republicans believed that global warming had been happening than Americans in general ($p < 0.001$), and that 12 percentage points more Democrats believed that global warming had been happening than Americans in general ($p < 0.001$) (see Table 1, Model 3).

5.2.4. Partisan gap

The actual difference in existence belief between parties grew slightly to 31.8% [23.7% - 39.8%]). On average, respondents more accurately perceived the divide. Respondents estimated, on average, that the partisan gap was 25.8% [23.4%, 28.1%].

5.2.5. Moderation by opinion deviance

In the 2018 sample of self-identified Democratic and Republican respondents (N = 535), 31% of respondents were opinion deviant, including 11% of Democrats and 57% of Republicans[2]. Both three-way interactions between existence belief, political party identity and target were significant ($p < 0.001$), supporting the opinion deviance theory (See Table 1, Model 4).

5.2.6. Opinion deviance and assumed similarity

Assumed in-group similarity and out-group dissimilarity was once again evident for aligned respondents (see Figure 2, panel 2). On average, opinion aligned Republican respondents estimated that significantly fewer Republicans thought global warming had been happening (b = -14.64, $p < 0.001$) and that significantly more Democrats thought so (b = 28.09, $p < 0.001$) compared to their estimates of Americans. Opinion aligned Democratic respondents estimated, on average, that significantly more Democrats thought global warming had been happening (b = 12.72, $p < 0.001$), and that significantly fewer Republicans thought so (b = -22.20, $p < .001$). In both instances, the size of perceived out-group dissimilarity increased from 2012 by around 10 percentage points while perceived in-group similarity did not change so dramatically (see Figure 2, panel 2).

[INSERT FIGURE 2 ABOUT HERE]

[2] These are percentages calculated using sample weights.

Once again, Democratic opinion deviant respondents did not differentiate the perceived similarity of the in-group (b = 3.07, p = 0.47) or the out-group (b = 4.18, p = 0.33) from the general public. Opinion deviant Republican respondents also did not perceive co-partisans to be more similar than Americans (b = -2.95, p = 0.24). Interestingly, they perceived significantly more (rather than fewer) Democrats to think global warming has been happening when compared to their estimates of Americans as a whole (b = 12.76, p < 0.001). They perceived Democrats to follow party cues (while in 2012 they perceived Republicans to follow party cues). For the complete regression coefficient estimates, see the supplementary material (Table S4).

5.2.7. Opinion deviance and the partisan gap

Opinion deviance influenced perceptions of the divide between parties. On average, aligned Republicans perceived an exaggerated gap (43.5% [36.6%, 49.4%] while aligned Democrats' average perception of the divide was within the 95% confidence interval of the actual divide (35% [30.9%, 39.0%]).

Once again opinion deviants underestimated the size of the gap and though the size of the perceived gap changed, it did not do so significantly. Opinion deviant Republicans' perceived the gap to be 14 percentage points (compared to 7.6 in 2012). Opinion deviant Democrats, on the other hand, perceived a smaller gap as in 2012 (0.4% in 2018 compared to 5% in 2012).

6. Discussion

The current research was conducted to both measure perceptions of others' beliefs in global warming with national probability samples of U.S. adults and to explore additional factors that influence perceptions of public opinion on global warming. Using two national probability samples of American adults, we found that Americans, on average, underestimate how many of

their fellow Americans agree that the world's temperature has been increasing. There is widespread bipartisan agreement that global warming is happening, yet this consensus is misperceived. While Americans, on average, accurately perceive that the majority of Americans and Democrats agree that the world has been warming, they inaccurately perceive what the majority of Republican party members think.

This research also adds to the literature on perception of public opinion by recognizing that some groups have spokespeople who send signals (opinion cues) to others about how group members should or do think. Importantly, not all members of these groups think alike, and some group members are *opinion deviant*; their privately held beliefs conflict with the opinion cues of their in-group. The data in these studies show that opinion deviance shapes perceptions of group members. When people's personal beliefs were aligned with opinion cues, they perceived others' beliefs in a way that is consistent with assumed in-group similarity and out-group dissimilarity. However, when people were opinion deviant, they perceived co-partisans and out-group partisans similarly. Opinion deviant people may be left with a cognitive conundrum, unsure of whether to assume fellow partisans think similarly to the self (assumed similarity) or whether elite figures from the group accurately describe the majority view (opinion cues).

Our theorizing about factors that influence perceptions is directional. It assumes that people form perceptions of others based on individual belief, opinion cues, group identity and the relationship between these variables. However, as some scholars have noted, the causal mechanism of social projection is unclear; perception of others' beliefs may influence individual beliefs over time through conformity (Gauthier, 2011). It is unclear from the current research whether perceptions of groups influence one's own opinion, or whether one's own opinion influences perceptions of groups. Do partisans adjust their individual belief to align with

perceived opinion cues of their party? And do partisans who are opinion deviant simply fail to recognize opinion cues, or do they ignore them in forming their own opinion? While the cross-sectional analyses conducted in these studies are consistent with the causal story of perception formation, more work should be done to clearly disentangle the causal pathway between perception of others, opinion cues, and individual beliefs.

Future research could document the specific cognitive processes diminishing assumed similarity among opinion deviants. In the current study, it was assumed that respondents are aware of opinion cues sent by prominent figures in the Democratic and Republican parties, but awareness was not measured. Since opinion cues are held constant in this study, the analyses cannot test whether opinion cues outweigh the influence of one's own belief as a data point, or whether they prevent people from using their own belief as a data point; this possibility could be explored in future research manipulating or measuring opinion cues. Further, it was assumed that opinion cues are dichotomous – that Republican party opinion cues send signals of disbelief and Democratic party opinion cues send signals of belief. However, it could be that opinion cues are not dichotomous as assumed here, but more nuanced. Perhaps opinion cues are linear and reflect the perception of how many political party leaders hold a belief, which in turn might influence how many political party members hold that same belief. Future studies could measure opinion cues and assess whether they are dichotomous or continuous, and how much influence those cues exert on the perception of how many political party members believe global warming is happening.

Opinion deviance also affected the perception of the difference between Democrats' and Republicans' beliefs about global warming. In contrast to previous research suggesting Americans perceive an exaggerated divide between the parties (Levendusky & Malhotra, 2015;

Westfall et al., 2015, Gromet and Van Boven, 2014), opinion deviants *underestimated* the gap. Perhaps opinion deviants recognize that their beliefs are consistent with the opinion cues of the outgroup, suggesting to the individual that the two groups are not as far apart in their opinions on issues as the public narrative suggests. Or, perhaps they project deviance onto others and assume that there are more opinion deviants in both the in-group and outgroup than group leaders admit publicly. Aligned partisans estimated a significantly larger difference between parties than Independents or opinion deviants, in line with previous research suggesting that people with more extreme viewpoints estimate greater differences (Keltner & Robinson, 1993; Spears, Eiser, & van der Pligt, 1989; Van Boven, Judd, & Sherman, 2012; Westfall et al., 2015).

Still, exactly why the widespread underestimation of American belief in global warming and the misperception of the Republican majority exists is not clear but warrants further investigation. Perhaps people fail to voice their stance on global warming because it is not salient or important, or perhaps the media continues to portray it as a contested partisan issue signaling to Americans that the mass public, not just the elites, are divided.

Or, perhaps people misperceive what others think and worry about acting counter to group norms. Inaccurately perceiving oneself in the minority has been shown to lead college students to silence themselves on the topic of climate change in group settings (Geiger & Swim, 2016). It is possible that Republicans who think global warming is happening (the majority) may not be willing to express that opinion because they mistakenly perceive a minority of their peers to hold that view; and Republicans who do not think global warming is happening may be more likely to express that opinion because they mistakenly perceive a majority of their peers to think similarly. Accordingly, actions in public might be reinforcing this false perception that

Republicans align with the opinion cues sent by political elites, media pundits, think tanks, and other non-governmental groups, contributing to the underestimation of belief in global warming.

The misperception of what others think may be an important barrier to engaging in bipartisan dialogue to address climate change. Future research could explore whether correcting misperceptions about belief in global warming fosters engagement; previous interventions have shown that correcting misperceptions of norms can positively affect attitudes and behaviors (e.g., Miller & Prentice, 2016; Prentice & Miller, 1996).

It is possible that opinion deviance is specific to perceptions of public opinion in the context of the issue of global warming. Whether moderation by opinion deviance occurs on other issues could be tested in future research. As noted above, it seems likely that this moderation might only arise on issues with clear in-groups and outgroups, as is the case with Democrats and Republicans and global warming. Future research could test this proposition, as well as whether certain types of opinion cues (e.g., the statements made by party elites vs. special interest groups) are more impactful than others, as suggested by past research (Brulle, Carmichael, & Jenkins, 2012).

Recognizing that opinion deviance shapes perceptions of global warming opens up additional research avenues to explore. It might be interesting to investigate how opinion deviance affects perceived certainty of others. Blatz and Mercier (2018) found that people may view out-group members' beliefs as less certain than their own. This indicates that individuals might perceive the out-group as more persuadable and lead people to attempt to persuade rather than attempt to find common ground. However, this research on perceptions of certainty is limited to an undergraduate sample and does not incorporate opinion-based groups. It is possible that opinion deviance might influence perceptions of certainty, which in turn can influence the

degree to which opinion deviants might engage with members of in-groups and out-groups on climate change. This avenue is worth exploring in the future.

Looking at how opinion deviance is related to the cultural cognition thesis may also be an interesting avenue to explore. Kahan and colleagues suggested that belief in global warming is related to cultural cognition and that individuals "form perceptions of societal risks that cohere with values characteristic of groups with which they identify" (Kahan et al., 2012, p. 732). Yet, opinion deviants express beliefs that may be considered in contrast to groups with whom they identify. Perhaps opinion deviants differ from opinion aligned respondents in their cultural worldviews (Kahan, Jenkins-Smith, & Braman, 2011).

And still other studies demonstrate a relationship between the perceptions of the scientific consensus on climate change and beliefs in global warming (Ding, Maibach, Zhao, Roser-Renouf, & Leiserowitz, 2011; van der Linden, Leiserowitz, Feinberg, & Maibach, 2015; van der Linden, Leiserowitz, & Maibach, 2018). Perhaps there is a relationship between opinion deviance and scientific consensus perceptions. While researchers suggest that an intervention in updating people's perceived scientific consensus might increase both beliefs in global warming and support for policies to address it, the causal evidence on the consequences of correcting scientific consensus is inconclusive (see Kahan, 2017).

6.1. Differences in perceptions between 2012 and 2018

While trends over time are not critical to investigating this paper's hypotheses, the two national probability samples offer the opportunity to not only test the robustness of the findings, but also to understand how Americans' actual beliefs and perceptions of their fellow citizens' beliefs on this issue may be changing.

On average, Americans', Democrats' and Republicans' beliefs in the existence of global warming has remained stable over time, as has the average difference in beliefs between party members. However, Americans, on average, did not perceive this stability. Specifically, they perceived an increase in Democratic citizens' beliefs and an increase in the perceived gap between parties.

The average perception of how many Democrats thought that global warming had been happening rose 6.4 percentage points ($p<0.001$). In contrast, respondents' perceptions of existence belief among all Americans and among all Republicans did not change significantly between the two studies. The perceived partisan gap grew noticeably for all Americans between 2012 and 2018 (7.8 percentage points, $p < 0.001$). On average, Independents, Republicans and Democrats all perceive the partisan gap to be increasing on this issue. While the trends are inaccurately perceived over time (i.e., there is no change in belief among Democrats and no change in the partisan gap), the perceptions of Democrats and the partisan gap in 2018 are closer to actual levels (see Table 2). A more careful analysis suggests that opinion deviance affects these changes over time.

The increase in estimates of Democrats was most notable among Republicans whose average estimate increased from 62.7% to 72.8%. All Republicans, both aligned and deviant, perceived significantly more Democrats to think global warming has been happening in 2018 than in 2012 ($p < 0.001$). Democrats did not perceive themselves significantly differently over time.

Aligned Republicans, opinion deviant Republicans, and opinion deviant Democrats did not perceive a significant change in belief among Republicans over time. Aligned Democrats,

however, did perceive significantly fewer Republicans to think global warming had been happening in 2018 compared to 2012 (-7.31 percentage points, $p = 0.01$).

With respect to the perceived partisan gap, only aligned Republicans and aligned Democrats perceived a significant increase over time. Opinion deviants remained steadfast in their belief that there is not a partisan gap on this issue.

7. Conclusion

The current study makes a novel contribution by testing how opinion deviance affects perceptions of others' beliefs about global warming. People do not assume similarity with in-groups or dissimilarity with outgroups when a person's own belief contrasts with the opinion cues sent by spokespeople and institutions affiliated with a person's political party. Still unclear, however, is why people underestimate the overall level of acceptance of the fact that the Earth has been getting warmer, and what happens when this misperception is corrected. Intervening to correct misperceptions of public opinion may prove a fruitful avenue for engaging the public on climate change.

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9. Tables and Figures

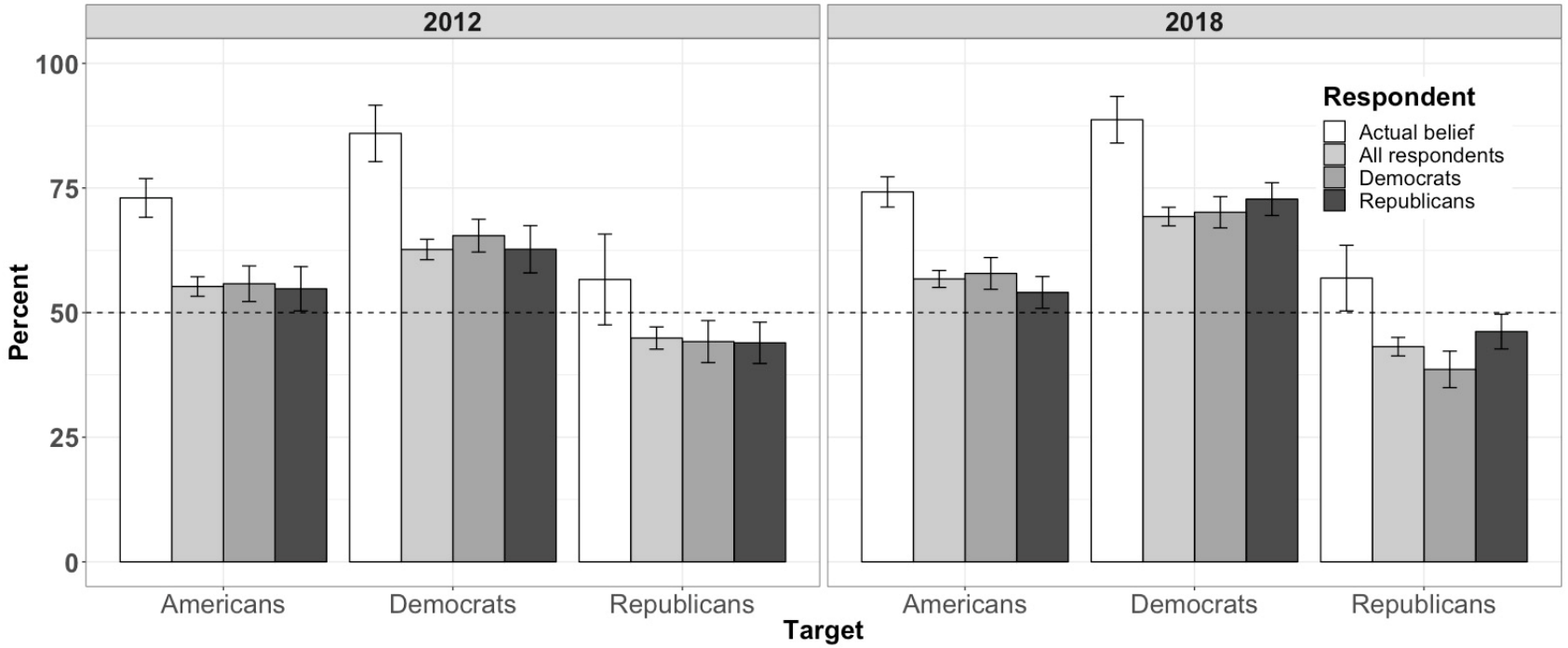

Figure 1. Estimates of others by respondent political party identity. The white bar indicates the actual level of belief for Americans, Democrats and Republicans. The light gray bar shows the average estimate provided by all respondents. The dark gray bar shows the average estimate provided by respondents who identify with the Democratic Party. The black bar shows the average estimate provided by respondents who identify with the Republican Party. The data for the left panel is from 2012. The data for the right panel is from 2018. The error bars are 95% confidence intervals.

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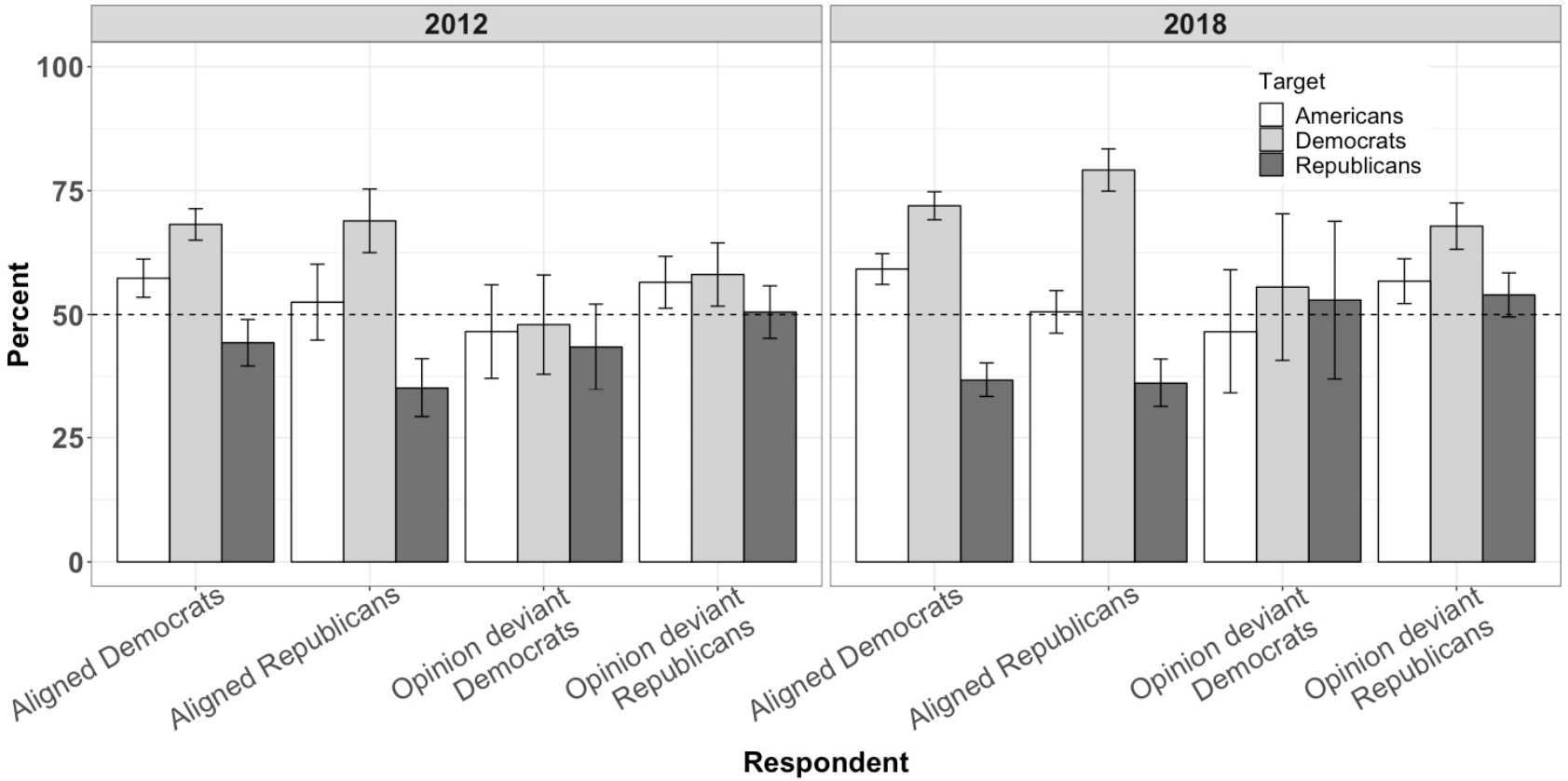

Figure 2. Estimate of others made by aligned and opinion deviant respondents. The white bar indicates estimates respondents made of Americans. The light gray bar indicates estimates respondents made of Democrats. The dark gray bar indicates the estimates respondents made of Republicans. In both 2012 (left panel) and 2018 (right panel) aligned partisans perceived a significant difference between the parties, perceived their own party members to think significantly more like themselves (in-group social projection) and perceived the other party members to think significantly less like themselves (out-group oppositional projection). The projection and partisan divide are not evident for opinion deviant partisans. The error bars are 95% confidence intervals.

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Table 1. Parameter estimates of OLS mixed-effects regression equations predicting how many others think global warming has been happening in 2012 and 2018. Standard errors are in parentheses.

		2012		2018	
	Fixed effects	**Model 1**	**Model 2**	**Model 3**	**Model 4**
	Target: Democrat (D)	7.40***	1.06	12.06***	3.07
		(0.89)	(3.83)	(0.91)	(4.65)
	Target: Republican (R)	-10.41***	-3.12	-13.56***	4.18
		(0.89)	(3.74)	(0.91)	(4.65)
	Think global warming has	6.71***	11.77**	5.48***	7.88
	been happening (GW)	(1.56)	(4.29)	(1.40)	(4.54)
	Respondent: Democrat (D)	1.69	--	-0.58	--
		(1.65)	--	(1.45)	--
	Respondent: Republican (R)	3.02	7.50	2.77	1.05
		(1.79)	(5.01)	(1.50)	(4.92)
	Respondent (R) * GW	--	-7.12	--	-1.96
			(5.71)	--	(5.49)
	Respondent (R) * Target (D)	--	15.68**	--	25.02***
			(4.79)	--	(5.38)
	Respondent (R) * Target (R)	--	-13.88**	--	-18.85***
			(4.72)	--	(5.38)
	GW * Target (D)	--	10.09*	--	9.92*
			(4.13)	--	(4.94)
	GW * Target (R)	--	-9.70*	--	-26.39***
			(4.04)	--	(4.94)
	Respondent (R) * GW * Target (D)	--	-25.23***	--	-26.53***
			(5.62)	--	(6.08)
	Respondent (R) * GW * Target (R)	--	20.73***	--	38.94***
			(5.56)	--	(6.09)
Gender	Female	-0.75	0.18	-0.86	-1.18
		(1.37)	(1.94)	(1.19)	(1.55)
Income	35k-50k	-3.99	-6.54*	2.05	-0.70
		(2.14)	(2.96)	(2.10)	(2.75)
	50k-75k	-3.22	-2.58	1.07	-3.72

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		(2.18)	(3.13)	(1.93)	(2.57)
	75k-100k	-0.49	0.09	0.92	-6.21*
		(2.57)	(3.52)	(2.15)	(2.78)
	100k+	-3.50	-2.18	0.99	-7.06**
		(2.23)	(3.11)	(1.85)	(2.53)
	Missing	-0.36	-3.96	4.21	0.15
		(2.64)	(3.80)	(2.37)	(3.24)
Age	30-39	4.80	5.84	5.33*	8.81**
		(2.71)	(4.39)	(2.12)	(3.00)
	40-49	-3.42	-4.23	2.34	6.29*
		(2.47)	(3.52)	(2.05)	(2.93)
	50-64	-3.11	0.52	2.49	6.77**
		(2.19)	(3.17)	(1.82)	(2.48)
	65+	-10.04***	-6.89*	-2.51	-0.26
		(2.31)	(3.30)	(1.90)	(2.45)
Education	Some college	0.15	0.08	-3.57*	-1.77
		(1.80)	(2.53)	(1.52)	(1.99)
	College plus	-1.61	-0.96	-1.94	2.23
		(1.72)	(2.40)	(1.51)	(2.03)
	Missing	11.44	28.81	-12.46	-19.78
		(9.40)	(17.92)	(13.03)	(17.57)
Region	West	1.06	0.82	0.39	-0.20
		(2.18)	(3.04)	(1.86)	(2.37)
	Midwest	0.37	4.91	-0.50	1.41
		(2.21)	(3.06)	(1.89)	(2.37)
	South	-1.17	2.07	0.48	-0.21
		(1.98)	(2.80)	(1.69)	(2.07)
	Missing	-3.70	-1.74	--	--
		(3.98)	(5.96)	--	--
Race/Ethnicity	African American	2.15	3.14	-3.21	-0.07
		(2.47)	(2.98)	(2.09)	(2.59)
	Hispanic	-1.93	1.31	-2.74	3.93
		(2.57)	(3.71)	(1.91)	(2.55)
	Other	0.37	0.47	0.18	1.36
		(2.61)	(4.18)	(2.09)	(3.00)
	Constant	54.67***	46.38***	52.70***	49.69***
		(3.11)	(5.42)	(2.84)	(5.26)

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N	**2359**	**1272**	**2866**	**1560**

Note: Unstandardized regression coefficients were calculated. The mixed effects additive models (Model 1 and Model 3) stack the estimates respondents made about Americans, Republicans and Democrats as the dependent variable. The random effect of respondent is taken into account. The multiplicative models (Model 2 and Model 4) only include respondents that identify as Democrat or Republican. The omitted variables for Models 1 and 3 include: Respondent, "Other"; Target, "Americans"; Gender, "Male"; Income: "less than $35k"; Age: "18-29"; Education, "high school or less", Region, "Northeast"; Race/Ethnicity, "White". The omitted variables for Models 2 and 4 are the same, except the omitted variable for respondent is "Democrat".
$^{*}p$ <.05 $^{**}p$<.01 $^{***}p$<.001

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Table 2. Average estimates respondents made about how many Americans, Democrats and Republicans think global warming has been happening.

		2012		2018			
Estimates made about	**Respondent political identity**	**Mean estimate (percent)**	**Standard Error**	**Mean estimate (percent)**	**Standard Error**	**Difference (2018-2012)**	**p value**
Americans	Republican	54.78	2.27	53.69	1.66	-1.09	0.70
	Democrat	55.80	1.82	58.59	1.66	2.79	0.25
	Independent	55.05	1.4	57.37	1.3	2.32	0.22
	Aggregate	55.24	1.00	57.04	0.88	1.80	0.18
	Actual level	73.00	1.98	74.21	1.55	1.21	0.63
Democrats	Republican	62.71	2.42	72.78	1.67	10.07	<0.001
	Democrat	65.44	1.68	69.88	1.67	4.44	0.06
	Independent	60.92	1.56	66.78	1.56	5.86	<0.01
	Opinion deviant Republican	58.08	3.25	67.72	2.37	9.64	0.02
	Aligned Republican	68.91	3.28	79.41	2.15	10.50	<0.01
	Opinion deviant Democrat	47.97	5.11	53.31	7.54	5.34	0.56
	Aligned Democrat	68.19	1.62	72.00	1.51	3.81	0.09
	Aggregate	62.66	1.05	69.10	0.98	6.44	< 0.001
	Actual level	85.95	2.89	88.7	2.38	2.74	0.46

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Republicans	Republican	43.94	2.12	46.2	1.78	2.26	0.41
	Democrat	44.19	2.15	38.81	1.88	-5.38	0.06
	Independent	45.70	1.64	44.60	1.40	-1.10	0.61
	Opinion deviant Republican	50.50	2.70	54.16	2.26	3.66	0.30
	Aligned Republican	35.17	3.03	35.95	2.51	0.78	0.80
	Opinion deviant Democrat	43.45	4.42	52.92	8.12	9.47	0.31
	Aligned Democrat	44.31	2.40	37.00	1.79	-7.31	0.01
	Aggregate	44.90	1.14	43.27	0.96	-1.63	0.28
	Actual level	56.65	4.65	56.93	3.36	0.28	0.96
Difference	Republican	18.77	2.49	26.59	2.61	7.83	<0.05
	Democrat	21.63	2.12	31.04	2.10	9.41	<0.01
	Independent	15.29	1.87	22.00	1.73	6.71	<0.01
	Opinion deviant Republican	7.58	2.36	13.71	3.48	6.14	0.15
	Aligned Republican	33.74	3.81	43.46	3.29	9.72	0.05
	Opinion deviant Democrat	4.96	4.49	0.39	4.45	-4.57	0.47
	Aligned Democrat	24.27	2.24	34.97	2.07	10.70	<0.001

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Aggregate	17.93	1.25	25.76	1.21	7.84	<0.001
Actual level	29.31	5.47	31.77	4.12	2.46	0.72

Note: Average estimates are calculated using sample weights.

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Highlights

- Some groups' spokespeople send opinion cues signaling what group members think.
- Opinion deviants are group members with beliefs in conflict with opinion cues.
- Opinion deviants do not assume perceive in-group or out-group members differently.
- Opinion deviants do not perceive a partisan gap on global warming.

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